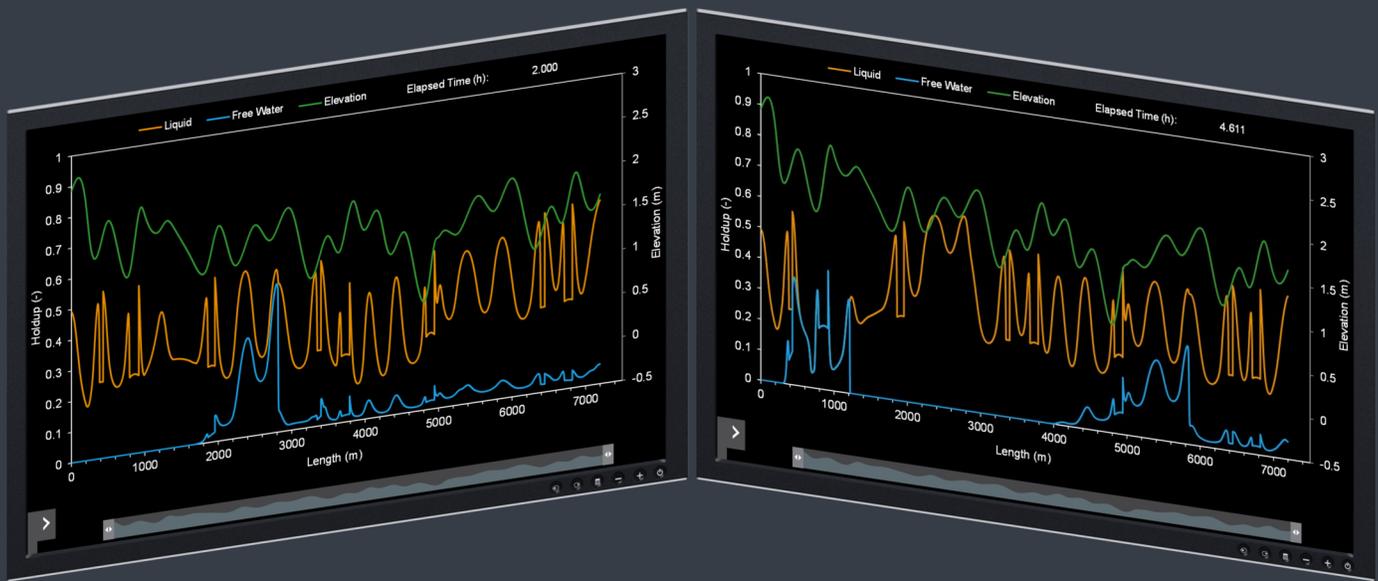


Digital Twins of Flowlines and Pipelines

Simulation-as-a-Service for high-fidelity modeling and 3D visualizing 2-, 3-, and 4-phase flows to manage corrosion, flow assurance issues, and operational risks in oil and gas gathering systems

2-, 3-, and 4-Phase Transient Digital Twins.



Key Features



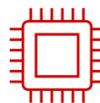
Fluids

- 12 combinations of produced fluids, drilling or control fluids, solids, and sludge
- Two aqueous phases: free water and emulsified water



Discretization

- Average grid cell size close to or less than pipeline diameter
- Adaptive grid refinement



Parallel Processing

- Higher-fidelity models – including more geometric detail, larger systems, and more complex physics
- Faster-than-real-time, high-fidelity simulation



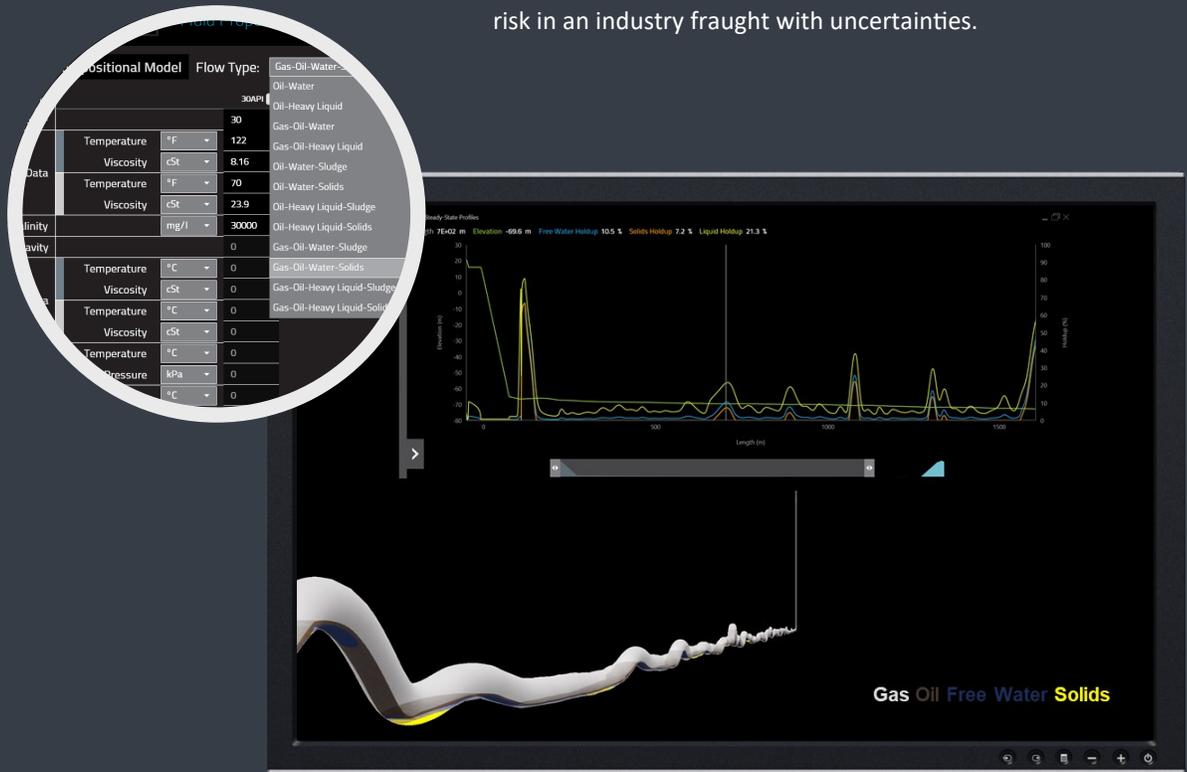
Adjustable Time Step

- Automatic determination of the time step size

Unmatched Accuracy & Scope

Preview the possibilities.

In diverse applications, Multiphase Cloud® helps energy companies comply with stricter regulations and face market pressures — while minimizing operating and maintenance (O&M) costs. By replicating different types of complex multiphase flows, we can help your engineering and O&M teams address the specialized requirements for optimal fluid dynamics in pipelines to enhance hydrocarbon production and provide uninterrupted, safe operation of oil and gas gathering systems. Through virtual modeling that makes the pipelines “transparent”, you can identify threats and effectively manage risk in an industry fraught with uncertainties.



Design

- Optimum diameter to minimize the costs of pigging and chemical inhibition throughout the life of the pipeline
- Improved design of unpiggable pipelines

Operation

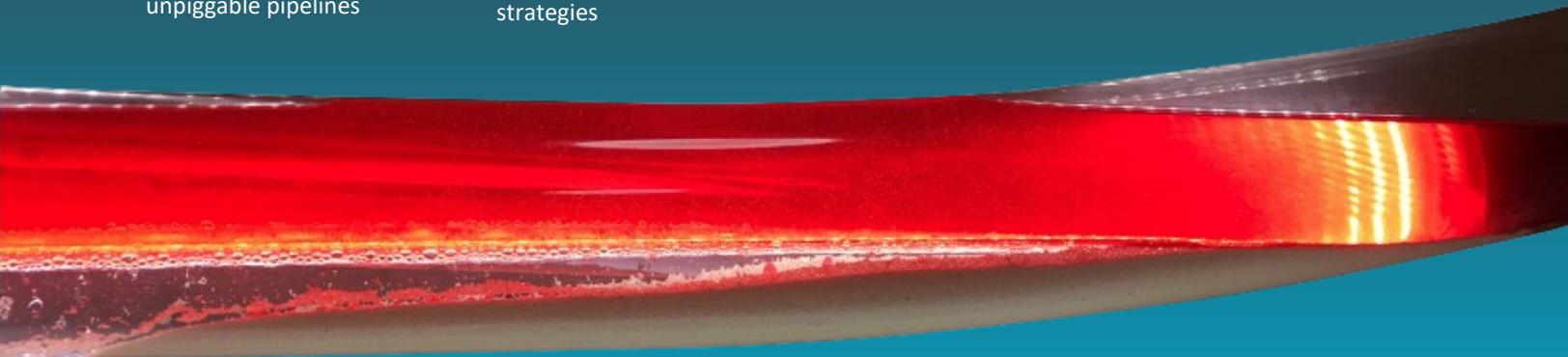
- What if analysis
- Total volumes of oil, water, and solids or sludge in the pipeline
- Onset of flow instability and its mitigation strategies

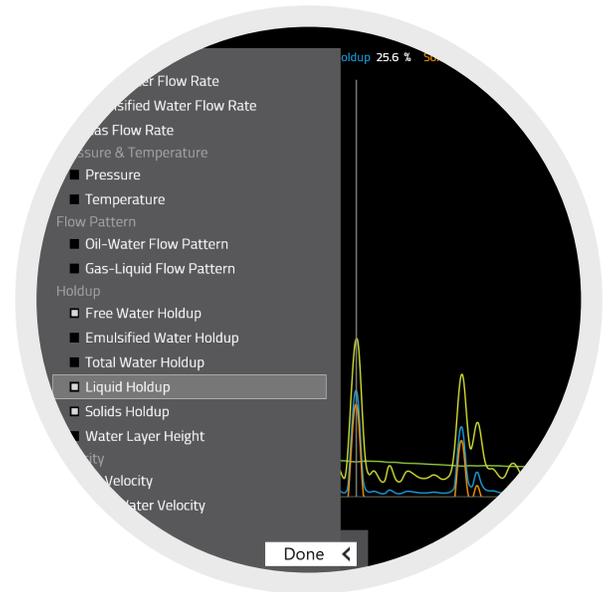
Maintenance

- Indirect inspection
- Internal corrosion monitoring
- Predictive O&M
- Root cause analysis (RCA)

Life Extension Management

- Analysis of material degradation
- Assessment of overall risk picture
- Development of mitigation measures





Technical Specifications

Flow Models

12 combinations of 2-phase, 3-phase, and 4-phase flows of produced fluids and solids or sludge can be simulated. Up to 36 flow parameters are predicted at each location along the pipeline. 5 gas-liquid flow patterns and 5 oil-water flow patterns in the liquid phase are determined. Two aqueous phases can be modeled: free water and emulsified water to simulate an emulsion breaking process in crude oil not related to its velocity.

Pipeline Profile and Discretization

Elastic deformations of the pipeline in the longitudinal direction are taken into account. Models of elbows, with the flow direction change in the vertical plane, can be constructed considering the design code used for their fabrication. A high-resolution discretization of entire pipeline is used in combination with adaptive grid refinement employed to simulate flow direction changes.

Solids and Sludge Transport Models

Proprietary models describe the transport of solids and sludge along the pipeline. These were developed and validated using field data for a wide range of flow conditions and applications.

Fluid and Solids Properties

A black-oil PVT model or an equation-of-state model is used to predict properties of the produced fluids. Solids properties are the properties of solid particles measured in a laboratory. Sludge properties are its rheological properties determined in a laboratory.

3D Visualization

A Digital Twin of a pipeline - whether planned or already built - will show how produced fluids and solids flow along that pipeline during its lifetime. A Transient Digital Twin can simulate the time-varying operating conditions and provide a deep insight into non-steady (transient) processes in a flowline or pipeline.

To learn more about how Multiphase Cloud can make a difference in your fields, visit www.mpecorp.com or contact your local Multiphase Cloud representative.

Multiphase Cloud®

Multiphase Cloud® is a simulation platform that contains the broad, physical modeling capabilities needed to model, visualize, and analyze simultaneous flow of all types of fluids and solids (gas, liquid hydrocarbons, water, sand, proppant, sludge, black powder, elemental sulfur, drilling mud, and control fluids) encountered in oil and gas production operations. It has been extensively used for simulating wells, upstream and downstream pipelines (over 450 systems with a diameter from 4 in to 48 in). The flow models were validated using six groups of different data types, including full-scale experiments, historical production data, historical coupon data, corrosion coupon installation and retrieval reports, thermography, scale-model tests, and ILI-survey data. Multiphase Cloud® was recently featured by NACE, the worldwide corrosion authority, in Materials Performance Magazine.